Numerical simulations of organized mesoscale convective clouds with community weather research and forecasting model

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Cloud Life Cycle Group
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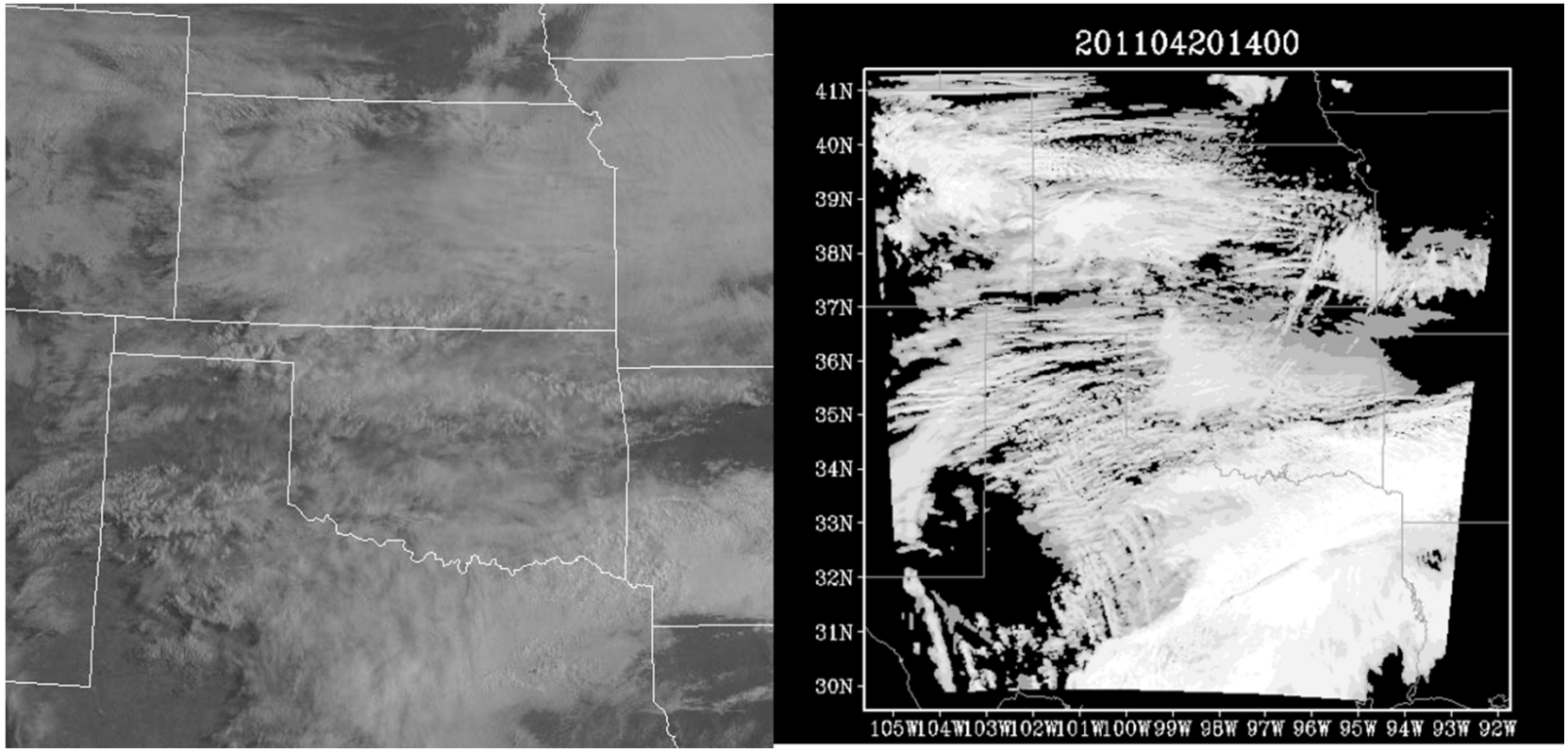
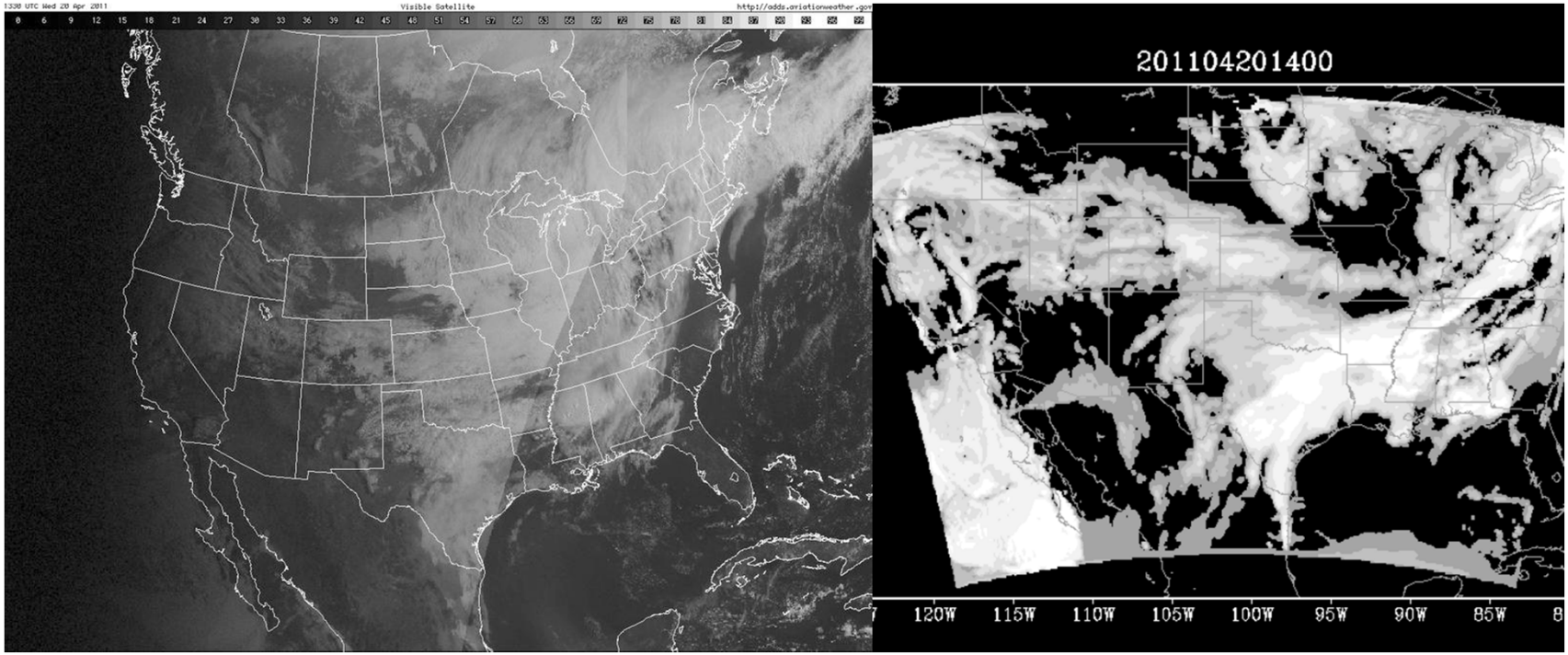
Can a mesoscale model simulate life cycle of clouds?



Can a mesoscale model simulate cloud life cycle?

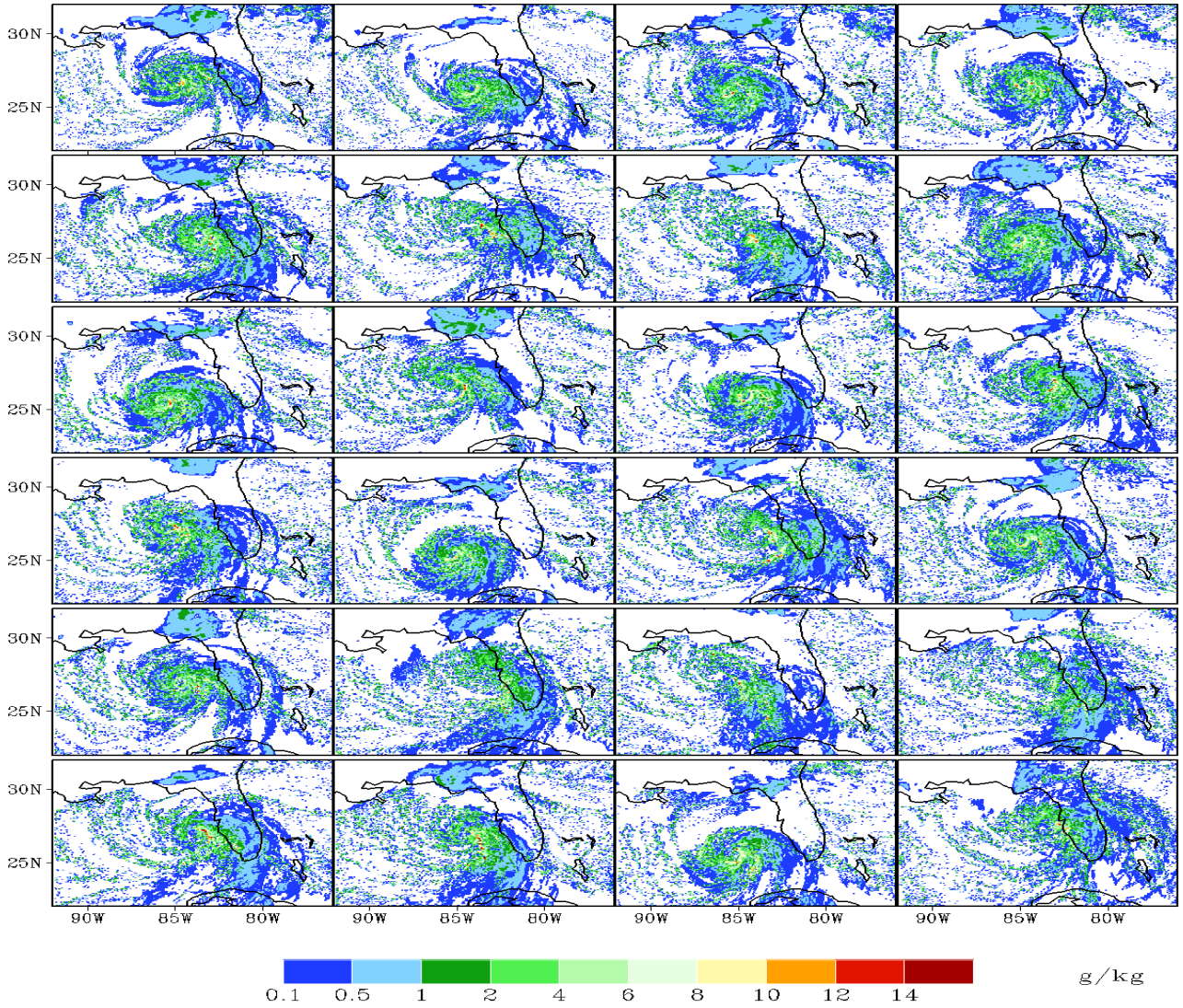


Sure. It can if it's at high-resolution.

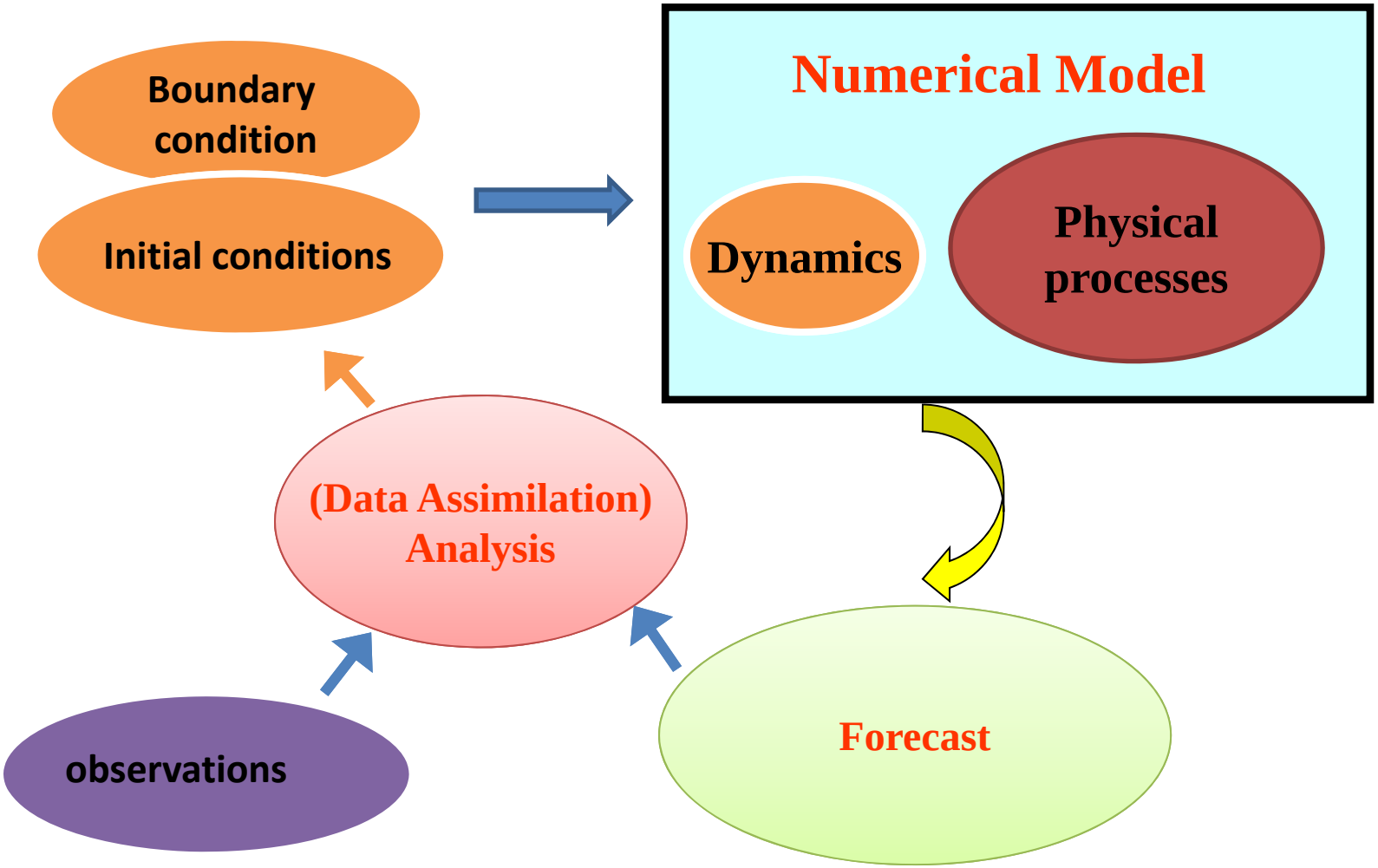
What processes contribute to accurate numerical simulation of clouds and convective systems in a mesoscale model?

- **Initial conditions**
- **Physics parameterizations**
- **Cloud microphysics**
- **Model resolution**

Ensemble forecasts of clouds over Hurricane Katrina (2005)

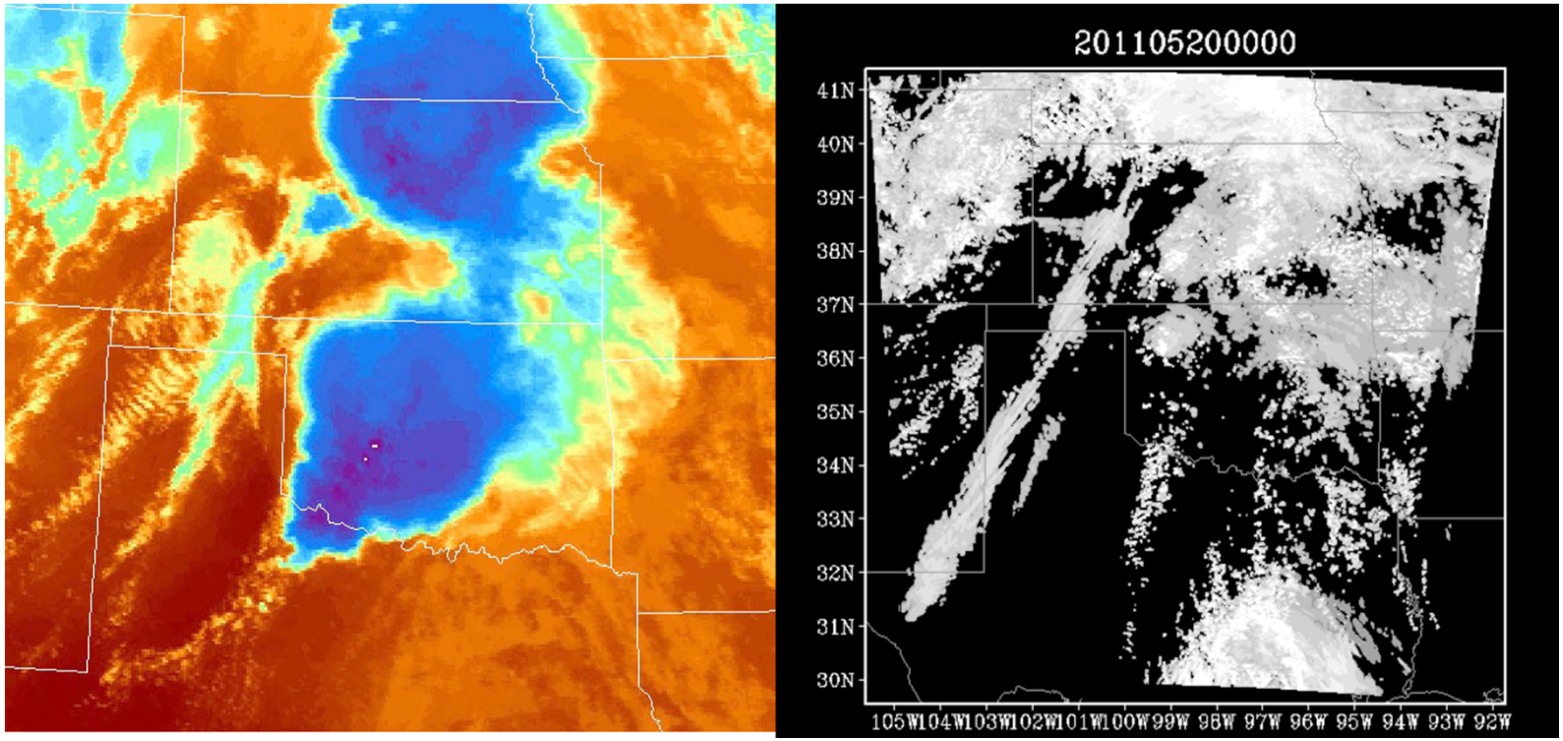


Data Assimilation (analysis)



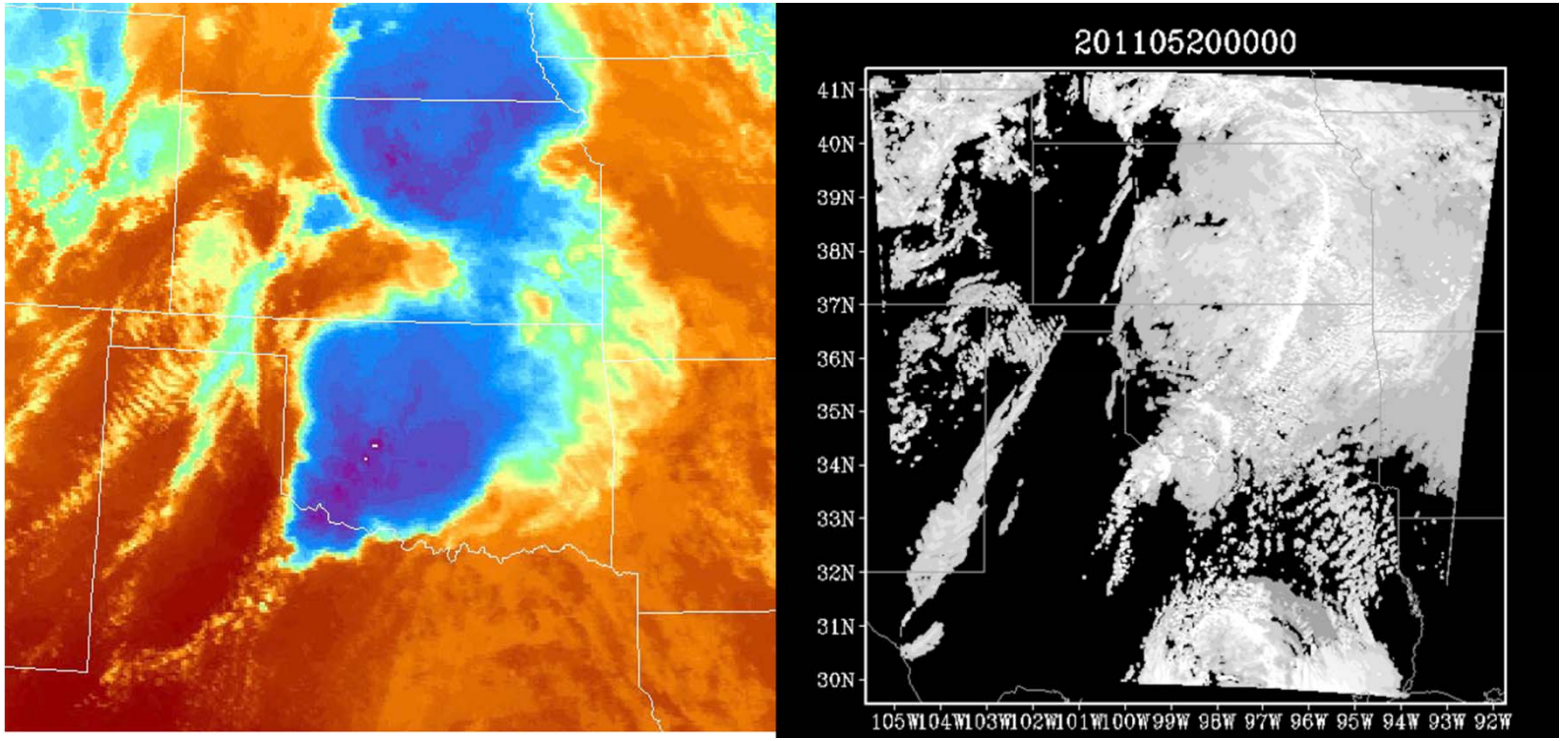
Impact of initial conditions

Without data assimilation



Impact of initial conditions

With data assimilation



Science issues

- Do we have good cloud datasets that are adequate to evaluate the clouds produced by mesoscale models?

  - Single station observations are limited for this purpose
  - Cloud coverage, cloud top, cloud properties (cloud liquid water path, ice water path); cloud hydrometer profiles and their distribution are specifically important

  - MC3E
  - ARM data - scanning radar

Science issues (Cont.)

- There is limited ability in the mesoscale community in terms of incorporating cloud observations into mesoscale analysis and forecasting.

  Do we have good data that can help us not only for the model validation, but also for the data assimilation and parameter estimation?

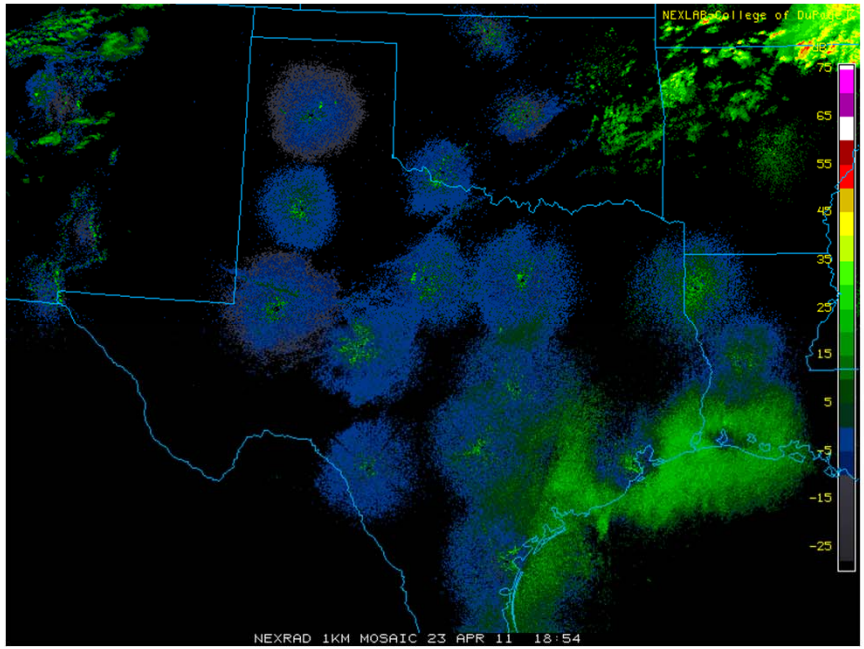
➢ How do we get good simulation of cloud life cycle from mesoscale models.

Data assimilation can help (for produce good initial conditions or good analysis). Then,

Based on available data and resources, what are the most useful analysis variables we can use for the cloud analysis and assimilation?

Water vapor, Cloud liquid water, Cloud ice water, Drop size distribution, … what else?

Use ARM data sets to develop cloud data assimilation (analysis) methods – integrating all different data from various instruments and sources.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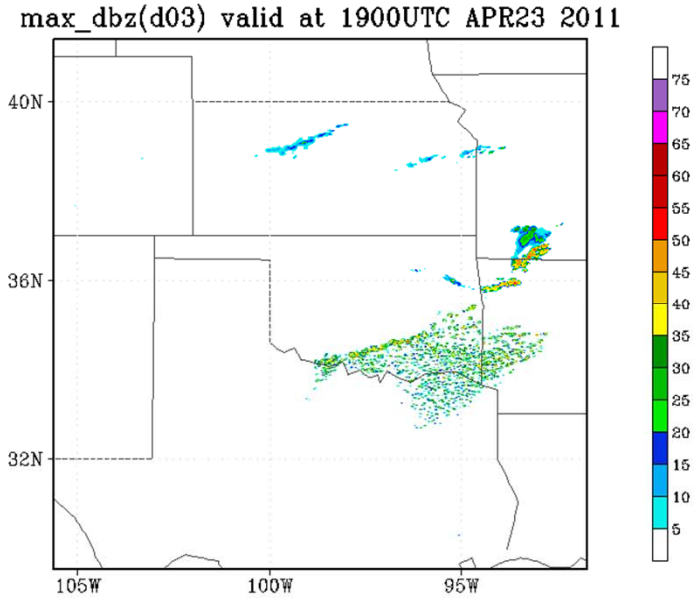
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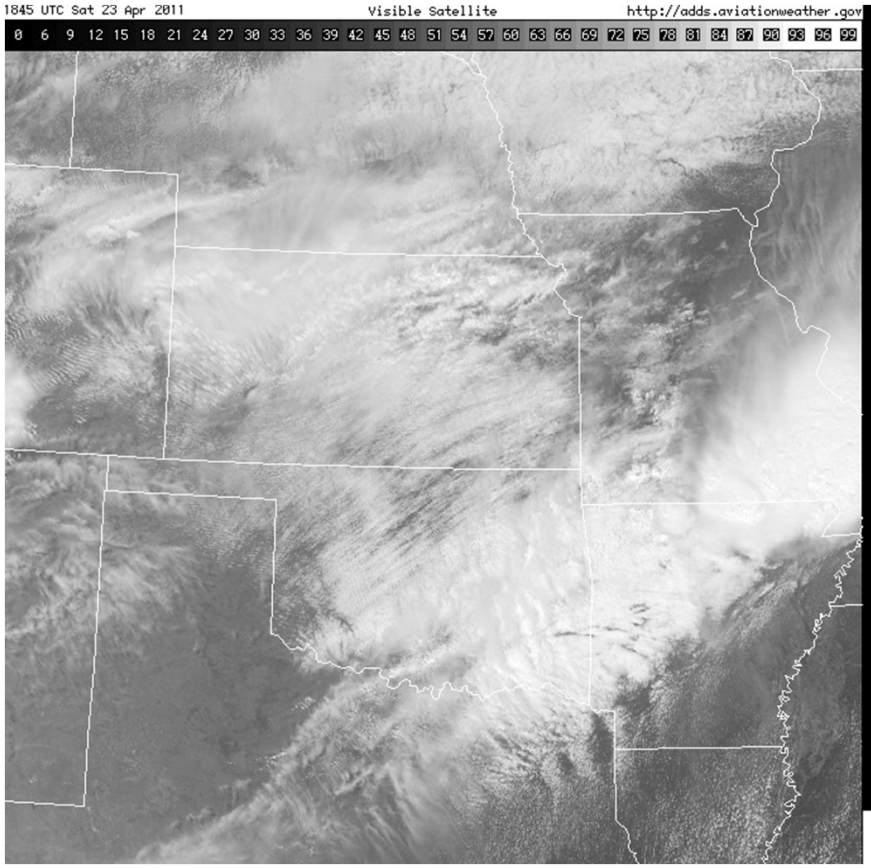
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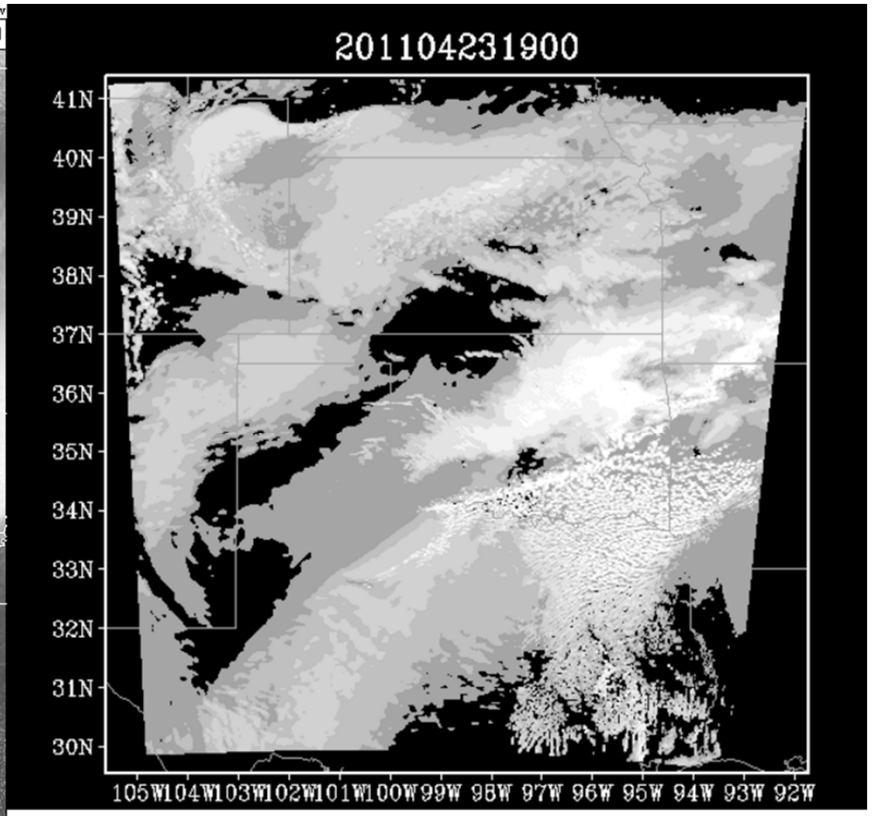
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